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VIA: _____ (SPECIFY AIR OR SEA POUCH) DISPATCH NO [redacted] 25X1

CLASSIFICATION

NY-2088

DATE: 15 March 1954 25X1

TO : Chief, [redacted]

FROM : Chief, [redacted] 25X1

SUBJECT: GENERAL— Engineering

SPECIFIC— RS-6 Modification

Ref: WASH 38606, dated 17 February 1954

1. The [redacted] engineering section has been making an extensive series of tests to determine how to reduce to a minimum the interference caused by the RS-6 agent radio station. This interference is caused by three actions. 25X1

(1) Switching a common antenna between the transmitter and the receiver.
(2) Switching power between these two units.
(3) Loud clicking in the earpiece.

The first two cause spurious radiation easily picked up on a home radio. With the increased use of F.M. receivers and Television in this area the problem may become acute. Customers who buy a "static-free" receiver will be quick to complain at the first sign of interference which could well be caused by an [redacted] radio set. At the present state of the art, interference with a television receiver might be tolerated because it is almost expected anyway. 25X1

2. Antenna switching is the biggest offender. Completing the circuit across the relay contacts from a D.C. standpoint with an R.F. choke made no measurable reduction. When the transmitter and receiver are tuned on or near (+ 500 Kcs) each other the transmitter output circuit offers high impedance to a received signal. A series of tests were run to see how much the sensitivity of the receiver would be decreased if the antenna were tied direct to the transmitter and switched to the receiver. Although the sensitivity was decreased only slightly this change had no effect on reducing spurious radiation because of the make/break relay action switching the antenna to the receiver. Two solutions are possible. One; use two antennas and eliminate this switching action of the relay. This defeats one of the advantages of the RS-6 over the non-break-in RS-6XX. Two; complete redesign of the transmitter plate tank circuit to a pi network and use direct antenna connections as with the RS-1.

3. Firing of the voltage regulator tubes with their 40 mill drain in the receive position causes a spark across the relay contacts. Conventional spark suppression reduces radiation from this source. Going one step further would be to eliminate switching the power between the units. Since the 6X4 rectifier tube can not stand the current drain of both units it would have to be replaced with a selenium stack rectifier. In an experimental model this was done together with jumping the antenna switching contacts. Removing the relay entirely from the circuit and just keying the transmitter cathodes still did not entirely eliminate the clicks. Returning the final cathode to ground and only keying the oscillator tube eliminated the spurious radiation. Correcting the first two defects eliminated the third,

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namely the ear piece click. Of course what we have now is essentially an RS-6XX usable for break-in operation provided two antennas are used. When used for battery operation the current drain is excessive. So much so that it would reduce to one half the usable time on the air from a fully charged battery.

4. We have now come full swing from an RS-6 to an RS-6XX. The problem now is to compromise between the two. If we cannot tolerate any spurious radiation clicks switching the antenna is out. We can switch the power and filter this action so as to reduce to an acceptable minimum these clicks. The filtering applied to power switching relay contacts produces a lag in the side tone monitoring oscillator. Since the antenna relay contacts will not be used they can be used to key the side tone oscillator.

5. The third source of noise is produced by the ear piece. Switching the antenna and power into the receiver causes a loud thumping of the ear piece diaphram. The operators head acts as a sounding board and these thumps can be heard through a closed door. If the antenna is not switched this thumping is reduced but additional limiting is required to cut off the click produced by switching the power.

6. Three solutions to the problem have been offered. One by [redacted], one by Headquarters and one by [redacted]. 25X1 25X1

[redacted] reported key-clicks being heard on European longwave broadcast band and suggested a 30,000 ohm resistor added between oscillator screen dropping resistor and B plus supply with a .002 mfd by-pass condenser to ground at the junction of these two resistors. A 220 ohm resistor was inserted between the relay contact supplying power to the receiver and the receiver plug. Separate antennas must be used. This causes the loss of one of the major advantages of this newer model set. 25X1

Headquarters proposed a 150 ohm resistor in the B plus supply to the relay switching contact and another 150 ohm resistor in series with a .01 mfd condenser between the transmitter supply contact of the relay and the high side of the first resistor mentioned above. A third 150 ohm resistor in series with a .01 mfd condenser was connected from the receiver supply relay contact to ground. An 82,000 ohm resistor was tied between the antenna and ground terminals.

The system suggested by [redacted] included; (1) a small R.F. Choke in series with the B plus lead to the relay switching contact, (2) a 1,000 ohm resistor in series with a .001 mfd condenser across the switching and receiver supply contacts, (3) a .01 mfd condenser from the receiver supply relay contact to ground. 25X1

All three systems called for the removal of C-115, a .01 mfd condenser connecting the receiving antenna contact of the relay to ground through the key.

7. In an attempt to determine the effectiveness of each system the following equipment set up was made. Five frequencies were monitored, two of which were in the 100 to 300 kc. band. The transmitter was tuned and the coupling to the monitor receiver kept as constant as possible. The output of the monitor receiver was adjusted to give two milliwatts noise into a matched load. The transmitter was keyed by the dot side of a semi-automatic key at about twenty words a minute and the average reading of the output meter taken. Many, many tests were performed and readings recorded. Various combinations of the components of each system were tried and its effect on radiation reduction measured.

[redacted] 25X1

The only thing these tests proved was that they should be made under controlled laboratory conditions. A screened room should be used and the primary A.C. power closely controlled. More elaborate and accurate test equipment than that available at [redacted] should be used. These tests could well be the subject of a Headquarters engineering project. 25X1

8. Removing the click in the ear piece proved the easiest of the three problems. [redacted] used a pair of 1N34 diodes back to back in series with 50 ohms across the output transformer. [redacted] used two 1N63 diodes across the output. Headquarters suggestion of a CK-705 or CK-707 diode in the ground return lead of the output transformer was the most effective and easiest to accomplish. 25X1 25X1

9. Each operational use of the RS-6 will have to be viewed from the amount of spurious radiation that can be tolerated against the advantage of one antenna. In either case the modification as specified in Headquarters "RS-6 Field Modification No 1" dated 20 October 1953 should be performed. This has proven from our tests to be the most effective.

FOR THE CHIEF, [redacted] 25X1

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